



Investigation over Efficient Broadcasting Mechanism in MANET

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Abstract— Mobile ad hoc network is nothing but the temporary network which is having the collection of mobile nodes. Routing and broadcasting are major operations of MANET network. The major operation in ad hoc mobile network is the broadcasting which sometime results to storm problem of the broadcast if the forwarding mechanism is not properly designated. Thus the challenges in the MANET are to reduce the broadcasting redundancy and under high transmission error rate provides high delivery ratio. Hence in our proposed research, we are introducing and investigating the new mechanism of broadcasting called Dual Covered Broadcast. This method takes the broadcast redundancy advantage order to improve packet delivery ratio especially under environments where transmission error rate higher. According to proposed approach, among the senders 1-hop neighbors, forwarding nodes which are selected are only retransmit the broadcasting message. There are two ways for selection of forwarding nodes and either of one is used depending on the network conditions. The source node provides forwarding node retransmission as acknowledgement of reception of packet. If the source node not getting the retransmissions of its forwarding nodes, source node resend the packets until the maximum threshold will reach. For the simulation of this project we used the Microsoft .Net framework and our simulation results shows that proposed method performing well under the high transmission error rate. From the simulated results we claim that investigated approach for the broadcasting is more efficient as compared to the existing approaches.

Keywords- Mobile ad hoc network, Dual Covered Broadcast

I. INTRODUCTION

Most basic and common future for the ad hoc network for mobile is that it enabling wireless communications among the participating nodes without the need of base stations. Two nodes, out of each other transmission range, need support of intermediate nodes for communication setup between the each other on which messages which are relayed. The most fundamental role is broadcast operation in MANETs because of the radio transmission broadcasting nature: By this transmission all nodes within the sender's transmission range will be affected when a sender transmits a packet. [3]

The advantage of this transmission is that, all neighbors can receive this message when node transmits a packet. This scenario is also called as "these transmitting nodes covered or dominate all neighborhood nodes." On the other side, outgoing transmission collides with incoming transmission i.e. exposed terminal problem. And also two incoming transmission collide with each other which means the hidden terminal problem. [3] [4] If each node forwards the packet once and only once, it makes every node as a forwarding node, it is called blind flooding. When nodes are forward many packets at same, the congestion in the network occurs due to the forwarded nodes and if the it is not designed carefully. This is called as storm problem for broadcasting. The idea is that the only one subset of nodes forwards the message that was broadcasted and the adjacent remaining nodes to the nodes fulfill the broadcast coverage. Broadcast congestions are reduced by them. A MANET is a set of the nodes which are randomly distributed that can results in the some regions, some of them are dense and others are sparse. One must select forwarding nodes carefully. From both the dense and the sparse regions of the network we can select similar no. of forwarding nodes, not only reduces the some density for the network, but also it will select some forwarding nodes which has a similar numbers and it is also do the same balance between the different the different network regions. From the some dominating set we can take some forwarding nodes. The dominating set means the set of nodes which contains the adjacent nodes in that set. [3] [6]

NP complete is the graph technology which is basically related to the networks. NP-complete graph is dominating set which is minimum connected in a given graph which we finding in a given graph; MANETs suffering from the high transmission error rates because of congestion and the congestion and the transmission connection with higher rate.

In the dynamic MANETs there are some major challenges for providing reliability for the broadcasting operations. In a high transmission error rate environment we providing the high density ratio and some other probability based algorithm for broadcast and error free environment with ideal state. This is our main aim at the time of selection of forwarding nodes. To ensure the broadcast delivery this uses acknowledgement messages. The problem of ACK implosion is in response of the reputation we send ACK messages to all the receivers which should becomes channel congestion and bottleneck of packet congestion. [6] [7] Thus in this research work, we are basically carry out the investigation over the single hop neighbor based broadcasting approach and 2-hop neighbor based approaches in order find out the effectiveness of them. We claim that DCB approach is performing better broadcasting operations as compared to all the existing approach in terms of various performance parameters.

II. PROPOSED APPROACH

In this project, as we discussed in the above sections different techniques already proposed for the efficient broadcast mechanisms but still they have following drawbacks associated with them:

- Ratio of packet delivery is very much less.
- No acknowledgement for the data received.
- Latency is very high.
- Wastage of channel energy and bandwidth.

Thus, in this project we are investigating new method for the broadcasting in ad hoc mobile networks called as DCB algorithm (Double Covered Algorithm) for the MANET. This DCB algorithm is basically used to select the minimal number nodes in order to relay messages and also acknowledgment for the nodes forwarding, in such way that we should not wait for the expiration of timers unnecessarily for long time. Here the packet is immediately retransmitted without any kind of delays and hence this increases the performance of this algorithm and packet delivery ratio. In addition to this, forwarding nodes numbers also reduced. We proposed study over the different broadcasting mechanisms here and then compare their results with new DCB algorithm for the performance evolution. Our Investigation studies finally claim that the new designed DCB algorithm are more efficient for handling ratio for the packet delivery, improved latency, and efficient utilization of bandwidth, reduced broadcast storm problem, minimized broadcast redundancy problem. [3] [4]

III. LITERATURE SURVEY

What is the MANET?

Now day's importance of the computers continuously increasing as well as increases demand of network connectivity. To establishing connections between computers we have been used wired technology for long time, but in the current market continuously increasing demand of wireless connection for the internet. Wireless local area networks are used which is a better solution for the networking era. It is depends on standard of IEEE 802.11. [11] The need of the connection establishment where the base station is unavailable means connections which are backbone. When in network field, it needs to be connecting two or more PDAs; to solving this problem of network that is ad hoc which is introduced. Ad-hoc network we can set anywhere without need of any wires or base stations, it called as mobile so the term MANET is used when we deals with the mobile ad-hoc networks. Wireless links of mobile routers connected by the MANET autonomous system for mobile routers. In the mobile ad-hoc network routers are move randomly, freely and organize independent arbitrarily. These networks may be connected to larger network. The type of network will not connect with static infrastructure like wired connection. This network has not preexisting infrastructure. In the cellular networks there are used radio network controllers, base stations etc. In ad-hoc network each peer connects with another peer and it will established peer-to-peer network communication? When in the network no any neighbor node will found then it will established communication link which takes the help of any intermediate radio terminal? Such network types are called multi hope peer-to-peer network communication [12] [13]. In the ad-hoc network the protocols in network should scattered throughout communication terminals. The wireless ad-hoc networks are nothing but the mobile ad-hoc network. MANET itself a self -configuring network wireless & in a mobile ad-hoc networks the wireless links are present in between the mobile routers. Arbitrary topologies are formed by the clustering of mobile nodes. In this case the routers are move freely randomly in the network and these are arbitrarily organized themselves. This results into fact that the wireless topology in the network may change unpredictably and rapidly. Standalone manner working of such a networks or larger internet is connected with them. [12] [13]

A mobile ad hoc network is also called as multi hop mobile radio network, which is a self-organizing and rapidly deployable network. In MANET there is not at all the wired backbone exists, as well as there is no exist any centralized control. All available wireless nodes in MANET are communicates with each other over existing wireless channels in the multi-hop and forwarding nodes needs fashion. Changing the some propagation conditions and mobility of network nodes there is need to adapt to the ad-hoc network to highly dynamic network topology.

In mobile ad-hoc networks each mobile node or device is bounded with a one specific transmitter and receiver and hence are said to be autonomous, dynamic and purpose-specific. The mobile ad-hoc networks doesn't have any master slave relationships, compare to the fixed wireless networks. All available nodes in the MANET which rely on each other to established proper communication for the information exchange, thus every node that acts as router. From above points, it is clear that in a mobile ad-hoc network each packet can be travel sometimes directly or they can travel from source to destination in a mobile ad-hoc network through nodes which provides the services of packet forwarding. [13]

Broadcasting in MANET

As we know the mobile ad-hoc network does not concept or things of workstation or server management system or base station which uses for the MANET, the ad-hoc network has some different bunch of the wireless nodes which communicates each other in particular time period. Each node or host which is combines with the Carrier Sense Multiple Accesses with Collision Avoidance (CSMA/CA) sender or transceiver. With the help of this the nodes or host communicate into both categories as single hope fashion or type and the second is multiple hope fashion or type. These are also called as directly and indirectly respectively. In the indirect or multiple hopes fashion the message or information divided into different packages and that packages reach to the destination by several other mediators as hosts or nodes. So this is the part mobile networks communication processes. Now we will discuss the process of broadcasting in MANET and different methods of broadcasting.

There are four categories of the Broadcasting methods in IEEE 802.11 MAC specifications.

1. In MANET each node rebroadcast packets using the, Simple flooding [13, 14]
2. Priority is assigned by each node to rebroadcast packet depending on the network topology, Probability based [15]
3. If the sufficient coverage area available then and then only node rebroadcast the packet, Area based [15]
4. Neighborhood based, neighborhood method maintains state on the neighborhood, for the rebroadcast it takes the information from the adjacent nearest node

Other than simple flooding, by minimizing message retransmission, each broadcasting category is optimizing energy and bandwidth. But our investigation is mostly related to the methods of neighborhood, thus we discussing this method as:

Self Pruning

In this type of network it is important to have all knowledge about the neighbors to the each node of the network. Using the periodic Hello messages we can achieve this. The receiving node having the list of the senders it compares that list with the neighbors list. Receiving node drops the packets that are messages otherwise. It is concept of neighbor acknowledgement which is illustrated in following figure. Here node 2 and node 1 receive the messages and they rebroadcast those messages to nodes respectively 4 and 3. These nodes are additional nodes. Node 5, after receiving the message rebroadcast message to the node 4 and node 4 is also additional node. This situation creates message redundancy.

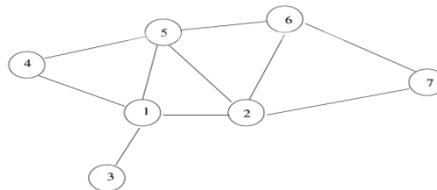


Figure 1: Self Pruning Approach [“Computer and Communication Networks” by Nader F. Mir]

Scalable Broadcasting Approach

Not only the self pruning approach retransmits the messages but there are various another approaches which perform the retransmission of messages which specified later

For this approach, there is requirement of acknowledgement of their neighbors up to a two hop distance in the MANET. This information is confirmed using the “Hello” messages. Information of two hope topology has in this approach,. In following Figure node 2 message is forwarded to node 1, node 1 gets all acknowledgement information about own and the broadcasted messages by node 2. RAD is helping to the rebroadcast extra messages of the node 2, node 4 till get the redundant messages. Pen and Lu dynamically managed RAD according to the given MANET requirements. Each node in network will go for neighbor with higher degree in its acknowledgement.

Ad-Hoc Broadcasting Approach

For this approach, the nodes those get chosen as gateway nodes and which broadcasts message header is permitted to broadcast the message again. This approach is explained as bellow:

1. Find out the two hop neighbors that can be connected by one hop neighbor. Gateways are chosen by these one hop neighbors.
2. The current gateway set gets the message by making some calculations for the cover set.
3. Find node that would approached by most two hop neighbors that are not included in cover set for the neighbors those are not in gateway set yet. This one hop neighbor is placed as a gateway.
4. Process 2 and 3 should be repeated up to all two hop neighbors get mapped.
5. The node decides which neighbors already get the message in same transmission when node gets a message and it is a gateway.

These neighbors are supposed to be covered and then they are removed from the neighbor used for choosing the next hop getaways. Node 1, 5 and 6 are neighbors of node 2 from distance of one hop, and the nodes 3 and 4 has two hop distance from node 2 in Figure 3.3. Node 3 can be trapped through the node 1 as one hop neighbor of the node 2. Node 4 can be trapped through node 1 or 5 as one hop neighbors of node 2. Then Node 3 also chooses node 1 as gateway for rebroadcasting the message to nodes 3 and node 4. When node 5 receives the message it will not rebroadcast the message because it’s not gateway.

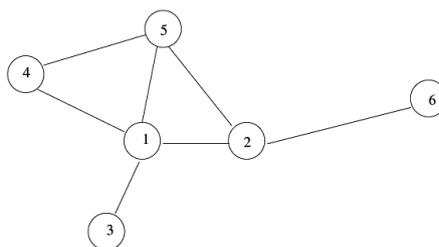


Figure 1.1: Ad hoc broadcast approach [“Computer and Communication Networks” by Nader F. Mir.]

Issues with Broadcasting

The reliability, bandwidth and battery power are main challenges in MANET. The network has unpredictable characteristics such as topology, signal strength fluctuation with time and environment, communication route breaks and the new ones that gets formed dynamically. Communication protocols and algorithms should be very small because of that storage needs and it saves energy and bandwidth. [13] Messages generation for all other nodes in MANET is done by source node. For routing information discovery broadcasting required in necessary in MANET, protocols such as dynamic source routing (DSR), ad hoc on demand distance vector (AODV), zone routing protocol (ZRP) and location aided routing (LAR) use broadcasting to establish routes. The node mobility is a scarce system resources because of there are more challenges in broadcasting MANET than wired network. In mobility there is no single concept which is more optimal for all scenarios. [26]

DCB Approach

In this part, first we will discuss existing algorithms for the broadcasting in MANET and then we will discuss the approach of DCB algorithm.

In the existing system they were used so many types of algorithms to broadcast the packets to the destination. They are:

- Dynamic Neighbor-Designating broadcast algorithm (DNDBA)
- Forwarding Node Set Selection Process (FNSSP)
- Ad hoc broadcast algorithm (AHBP).
- Partial dominant Pruning algorithm (PDP)

IV. RESULTS AND DISCUSSIONS

In this project we create simulation of single set neighboring as well as dual set neighboring algorithm. In mobile ad hoc network when any node will not detect path for data transportation that time mobile ad hoc network will fail using single neighboring algorithm. When message send from source to destination, when this message enters into the network then router finds path which nearest and feasible to reach the message into destination, when we can use single neighbored algorithm then router finds only one path for message transferring and all the packets traverse indecently through this path, in this type of routing when any node destroy from this path then single neighbored algorithm not able to find neighbor node for sending message to the destination at that time connection is break and errors are generated. In this algorithm most of time network failure problems are generated. In this algorithm router find two paths which nearest to reach message to the destination, when packets travelling using one path when any network failure is generated then it will quickly shift into the second path. In this type of network message transferring is very fast, because it finds nearest path.

When we start our simulation then it will shows simulation window in that first we must set some following parameters.

Add Nodes: This property we used for to add number of nodes into network.

Refresh Map: this property we used to refresh our map, and then after we will add new number of nodes for network.

Start Mobility: Start mobility property we will use for start mobility of our network.

Set source and destination Nodes: This property is used to set the source node and the destination node where we want to data transfer from one destination to another. When we set source node and destination node then it will shows path for traverse from source to destination node.

Single neighbor set Routing: this property is used to display single neighboring path for data transportation on the network. in single neighboring if any node not having neighbor then it will not able to show path between source and destination node.

Dual set neighbor Routing: when we clicks on dual set neighboring button then it will shows two paths for data transportation into the map.

Comparison of delivery ratio: when clicks on this button then it will shows efficiency of path, means single neighboring or dual neighboring not finding path for data transportation then it will shows delivery ratio is zero. If 50 % percent path is created and for next path neighbors are not available then it will shows delivery ratio around 50%.

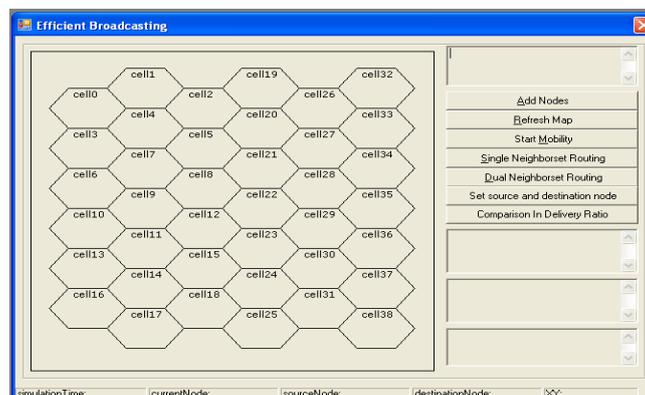


Figure1: Simulation window for the MANET network for the Dual Neighborset and Single neighborset routing algorithms.

Thus from the above figure 1, we are investigating the two ways of broadcasting mechanisms such as Single Coverage broadcasting and Double Coverage Broadcasting mechanisms for their performance evaluation. In this simulation window, there are different components and functionality added into the mechanism such as, loading the mobility pattern, setting the source and destination, running single neighbor set routing, running dual neighbor set routing, creating the new MANET, running the simulation etc.

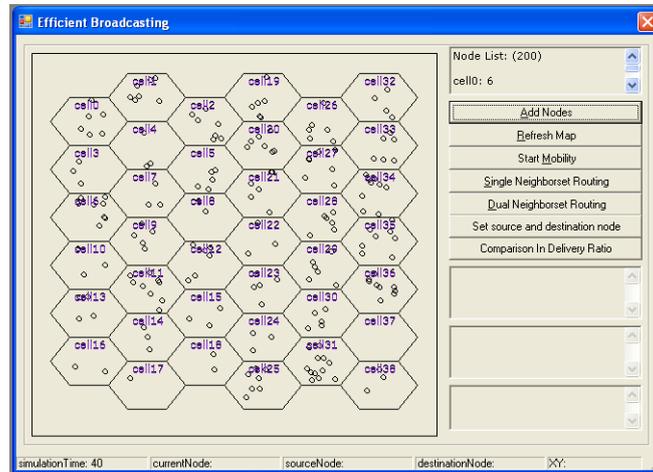


Figure 2: Mobile node adding to MANET functionality.

This figure 2 showing the all the active mobile nodes with their allocated cell numbers and their current network position.

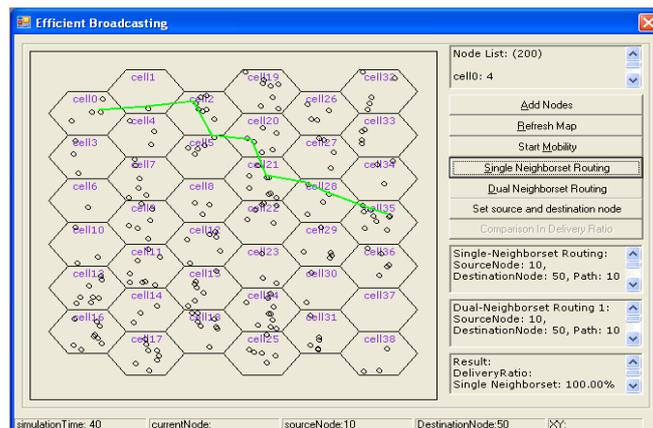


Figure 3: Single Neighborset Approach Execution.

This figure 6.3 shows that, broadcasting based routing using the single neighborset mechanism in which the source node is 10, destination node 50, and we have got the 10 paths without the acknowledgement of message forwarding and high network latency as well as reduced packet delivery ratio. These are clearly indicating from these network scenarios.

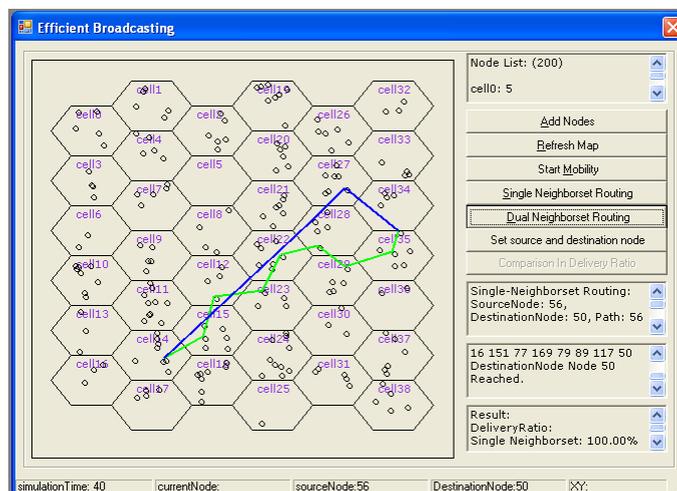


Figure 4: Dual neighboring Routing Approach.

This figure 4 shows that, broadcasting based routing using the double Neighborset mechanism in which the source node is 56, destination node 50, and we have got the 56 paths with the proper acknowledgement messages from all the forwarding nodes, with minimized latency and increased packet delivery ratio.

V. CONCLUSION

As we discussed results in the above sections regarding to the performance evaluation of new DCB algorithm, this provides the high delivery ratio by minimizing the broadcast redundancy. DCB achieved this improved performance only by requiring the selected forwarding mobile nodes amongst 1-hop neighbor of sender node in order to forward packet. Some kind of redundancy is provided by the set selection process of double covered forwarding node in order to enhance non forwarding nodes delivery ratio in such way that retransmissions is suppressed remarkable while considering transmission errors. We did the simulations by instigating the two approaches such as this proposed DCB approach and one with single neighborset approach which shows that DCB has low forwarding ratio, high delivery ratio, low average delay and low network overhead for the operation broadcast under the environment of high transmission error ratio. In addition to this, DCB approach is more sensitive for the nodes mobility. As the mobility of mobile nodes increases, the delivery ratio for the DCB approach drops. The most important reason behind this is that nodes of high mobility making the mobile node neighbour sets quickly. Such kind of information of incorrect neighbor set will be resulted into the missing broadcast packet. Finally the DCB method is more efficient broadcasting scheme as compare to the existing performances of MANET broadcasting approaches. For the future work, we recommend to carry out the investigation of NACK mechanism as well as effects when mechanism of NACK is applied.

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